Observations of Megaripples

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LONG-TERM GOALS

The long-term objective is to develop models that predict the presence (or absence) and characteristics of seafloor megaripples given geological (sediment characteristics, underlying geological framework) and hydrodynamical (waves, currents) conditions.

OBJECTIVES

Bedforms with amplitudes of *O* (1 m) and lengths of *O* (10 m) (megaripples, bumps, and holes) are believed to form and migrate on seafloors with mobile sediment for a range of wave and current conditions. Strong currents that produce sheet flow can destroy bedforms. The specific objectives here are to observe seafloor bedforms, waves, and near-bottom currents to determine

- wave and current conditions that produce megaripple-sized bedforms
- relationships between megaripple size and waves, currents, and bottom stress
- megaripple migration rate as a function of waves, currents, and bottom stress
- conditions that cause megaripple destruction

APPROACH

To obtain field observations of megaripple sizes and migration rates, waves, currents, and near-bottom stress this fall, we will deploy 2 sonar altimeters, 4 current meters, and a pressure gage in a dense array close to a sandy seafloor in about 5-m water depth on the southern California coast (Figure 1). The altimeters will be mounted on a frame that can be rotated, allowing continuous monitoring of megaripple heights and migration rates in either the cross- or the alongshore direction. The altimeter array will be collocated with 4 acoustic Doppler current meters to estimate near-bottom stress. The current meter array also can be rotated from a cross- to an alongshore orientation. By maintaining the instruments from November until late spring (possible at this relatively warm water site), we expect to observe a wide range of bedform heights and migrations, waves, and currents.

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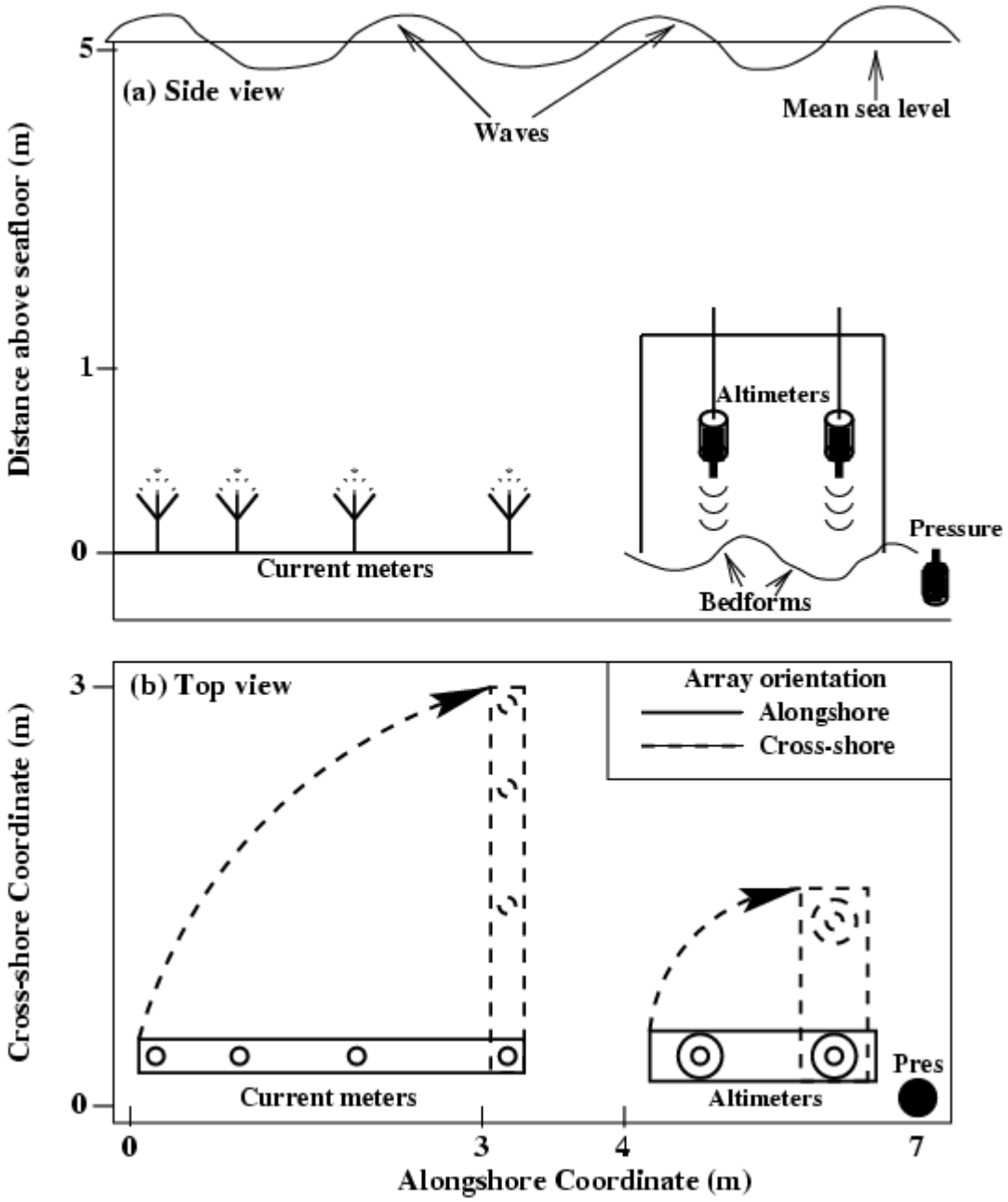

Figure 1. Sketch of megaripple detection instrument array. The side view in the upper panel (a) shows approximate alongshore-oriented deployment locations. The top view in the lower panel (b) shows that both the current meter and altimeter arrays can be rotated 90 degrees, allowing cross- and alongshore alignments.

The altimeters provide time series of seafloor elevation at spatially separated locations, allowing determination of megaripple heights and migration speeds. The pressure gage and the array of current meters provide observations that allow megaripple characteristics to be correlated with waves and near-bottom wave-orbital velocities, mean current, and stress. By rotating the instrument arrays, megaripple migration can be observed in both the cross- (dominated by wave-orbital velocities) and alongshore (dominated by mean currents) directions.

WORK COMPLETED

We have been preparing for the November 2000 deployment. Instrument frames have been designed and are under construction, and the current meters and the pressure gage have been calibrated. Software for real-time data acquisition and display is being written.

RESULTS

None (new start).

IMPACT/APPLICATIONS

One potential impact of this study will be an improvement of Navy operational mine burial prediction models.

TRANSITIONS

None (new start).

RELATED PROJECTS

The near-bottom stress estimates are in collaboration with J. Trowbridge (WHOI). We also are collaborating with P. Traykovski (WHOI) on studies of bedforms in shallow water.